sending and receiving email, FTP servers for file transfers, and HTTP servers for web page requests.

[0561] A command service is a grouping of commands. A command, which is also a component, is a set of configurable instructions that process input to produce output. Multiple commands can be combined to perform more complex tasks. Some of the largest advantages of component integration engine are derived from command services component integration engine makes command services available and provides the mechanism for combining multiple commands together to accomplish a more complex task component integration engine manages the security and resource access related to these commands, and can return the results in a format appropriate to the user access point. Examples include DatasourceCommandService for accessing data stored in databases, EmailCommandService for sending and receiving email, XSLTXMLService for formatting HTML and XML, and RoadMapService for combining commands to perform more complex tasks.

[0562] The components and resources available as part of component integration engine will now be described. Developers may create additional components to support existing and new technologies not already part of component integration engine, so this list may not describe all available components. Other components integrated into the component integration engine may include similar documentation.

[0563] Certificates are public keys that can be used to digitally sign data or encrypt data that can be decrypted only with the correct private key. Certificates are held in certificate stores and are accessed by retrieving the appropriate certificate store from the certificate_store manager. Certificates are read-only and can be used by any number of processes simultaneously.

[0564] FIG. 37 illustrates the certificate_store manager. In this case, three certificate stores have been bound to the manager: la_license, SSL, and Digital Signatures. The first, la_license, is required to verify licensing. SSL contains certificates that can be used to implement secure web connections using the secure socket layer (SSL) protocol. SSL is an earlier form of the transport layer security (TLS) standard. The last store contains the certificates for two company executives "manager 1" and "manager 2." These executives can use the certificates to sign electronic documents verifying their own identity and ensuring that the document cannot be changed after their signature is attached.

[0565] One certificate store named "license", that is authenticated by the owner of the computer integration engine server, may be necessary in order to start the component integration engine.

[0566] Four managers exist to control functionality related to models: model to common, common to model, known models and modelloader: 1. The model_to_common manager translates between the fully qualified model name and a simpler name. For example, the model mail.server.DefaultMailStore of the present invention can be mapped to DefaultMailStore to make it easier to remember and less confusing. 2. The common_to_model manager translates between the simpler name and the fully qualified model name. 3. The known_models manager maps an interface to a list of models that implement the interface. This manager

is useful whenever a component of a specific type is needed. Instead of trying to remember the names of components of that type, a list of all known components is provided. 4. The modelloader manager controls modelloaders. A modelloader is a component that finds the binary representation of a model and loads it into the program as a model. Modelloaders represent strategies for finding binary representations of models and can allow model loading from files, compressed files, databases, network sockets, or other locations.

[0567] A customizer or customizer manager is a component that knows how to configure, or setup, some other component for use. The customizer can build a metadata object containing all the constructor descriptors, method descriptors, attribute descriptors, and signal descriptors. A customizer can also access one attribute at a time or create a configuration object holding all attribute values. Configuration files can be stored and used to later reset all values. This mechanism is used during startup to configure the virtual hosts, service contexts, services, and managers. **FIG. 38** shows a customizer manager mapping a type of component to the customizer responsible for customizing that type of component.

[0568] The datasource manager controls datasource objects. Some, but not all datasource objects, that are databases. Datasources return connections for the purpose of retrieving or modifying data. The datasource object is responsible for determining how to share connections and whether or not individual security credentials are required.

[0569] Three managers are related to images: image, image decoder and image encoder: 1. The image manager stores image descriptors for common images. An image descriptor knows how to load or build an image. 2. The image_decoder manager stores image-decoding components. Images stored on disk are stored in different formats such as GIF, JPEG, or bitmap. Image decoders convert between the stored format and the format used to render (draw) the image on the screen. 3. Image encoders, managed by the image_encoder manager, perform the opposite task of converting a screen image to a format for storage.

[0570] Two managers are related to logging events and failures: log and log target: 1. The log manager is responsible for managing logger objects. Logger objects accept messages and errors and write those messages to each of its log targets. Multiple loggers can share log target objects, so they are shared in the log_target manager. 2. A log target can store messages in a file, on screen, in a database or any other location desired. A log target can also filter messages to accept only messages with high error levels, errors of a certain type or in a certain type, or errors that occur at certain times of day. Filtering log messages accepted by a log target can allow for scenarios where all error messages occurring after 5:00 pm are sent to the system administrator's pager.

[0571] Two managers manage email components: mail server and mail store. 1. The mail_server manager contains known email servers configured to send outgoing email or receive incoming email. The details related to socket protocols, login information for shared accounts, and stored protocols are handled by the mail server component. 2. The mail_store manager manages local email storage. Mail stores are used by socket services that provide POP3, IMAP, and SMTP socket protocols. The emails sent or received are stored in the mail store until retrieved by a user.